suppose to have some influence on the Lepidoptera and Hymenoptera; it is provincially called the potatoe-wood; it is at that time covered with blossoms, which, though they grow in thick racemes, offer nothing pleasing to the sight or the scent. But these form the centres of attraction to the insects I have named; *Pierides* and *Theclæ* in particular flutter around the summits in considerable numbers, and swarms of small beetles and flies. The *Bauhinia* displays its elegant blossoms, and in one corner a large patch of *Cassia* attracts *Papiliones* and *Coliades*; but in general there is an almost total lack of the flowering herbaceous vegetation that fringes the roads in most other places. It is remarkable also that the trees in these woods are nearly, if not quite, destitute of epiphyte *Orchidaceæ*, which are so abundant on Bluefields Mountain at a similar elevation, that hardly a tree is without one or more specimens. But in other respects the character of the vegetation in the two regions differs greatly.

This district I habitually visited every alternate week, very frequently spending eight or ten days at a time with my worthy friends at Content. Probably two-thirds at least of my collection of insects were the result of my labours here. The elevation of the region may be assumed (I speak only from my own estimate) as ranging from 1500 to 2000 feet above the sea.

Before I leave this subject, I would add, that during the period of insect-abundance on the Hampstead road, a large number of species were taken by flying in at the open windows of Content cottage by night. Many valuable specimens occurred in this way, not only of the crepuscular and nocturnal Lepidoptera, but of other orders in considerable variety. *Curculionidæ*, *Longicornes* and *Lampyridæ* were very numerous. I am inclined to think that a far greater number of insects are active by night than by day.

At length then I proceed to the list of species, deferring the notice of a few other less important localities until they arise.

[To be continued.]

XIII.—*A few general Remarks on the Fossil Conchology of the Great Oolite of Minchinhampton in comparison with that of the same Formation in other localities.* By John Lycett, Esq.*

The following observations have been suggested to me by a remark of Dr. Buckland in his Bridgwater Treatise, and which has since been occasionally quoted and repeated by others;—in effect, that during the vast period when the secondary formations

* Read before the Cotswold Naturalists' Club at Purton, August 3, 1847.

were in process of deposition, a molluscous class (the carnivorous Trachelipods), which in our present seas perform the office of keeping down within due limits the other molluscous races, did not then exist, or that they were extremely few, and that it was only on the extirpation of those extensive genera of Cephalopods, the Ammonites and Belemnites, at the commencement of the tertiary epoch, that the carnivorous Trachelipods made their appearance. Living in a district distinguished by a great profusion of molluscous remains, a large proportion of which are absolutely unknown to science, a favourable opportunity for testing the correctness of the foregoing theory was presented to me, more especially as these remains occur in an unusually good state of preservation, extending in some instances even to the original colours of the univalves, the hinges of the bivalves, and the external ligament of the hinge in the latter shells. Before however stating the results of this inquiry, a very brief sketch of the physical and geological characters of the district may not be unacceptable to the members.

A circle having a radius of only four miles, with the town of Minchinhampton in the centre, will comprise the whole district to which these fossils refer. The Bath Oolite, or Compound Great Oolite as it is now termed by geologists, is the uppermost formation; its continuity is however broken by two great valleys of denudation, the vales of Brimscomb and Woodchester, which, with their numerous lateral ramifications, have cut through the whole series of rocks from the upper part of the Great Oolite to the middle of the lias inclusive, having a mean depth of 500 feet, thereby producing a combination of circumstances eminently favourable for exposing the useful beds of stone and conveying it by water-carriage.

The divisions of the Compound Great Oolite are, Great Oolite and Fuller's Earth, the former having a thickness of 130 and the latter of 70 feet. At some few localities the base of the Great Oolite has one or two beds of true Stonesfield slate associated with brown marls. In this respect however, as in the mineral character of the formation generally, the greatest variety and uncertainty exist; opposite sides of the same quarry will often exhibit such a change; thus an oolitic and shelly limestone will pass into a barren sandstone. Keeping this fact in view, a considerable latitude must be allowed in the following arrangement, which is given only as a general and approximate view of the whole series of beds. The Great Oolite proper may be conveniently subdivided into three series of beds, an upper and lower fossiliferous, often serviceable for building purposes, and a middle, more barren and unserviceable. Beginning with the uppermost, or those which immediately underlie the Bradford

clay, we find an alternating series of limestones and clays or marls, extremely variable both in thickness and extent. Certain of these bands, and more especially one of a compact cream-coloured limestone, are eminently shelly, but will seldom allow of the shells being separated entire. These gradually pass downwards into the middle subdivision, where the rock is more barren of organic remains, and sandy.

The lower subdivision assumes a very different aspect: we here find 35 or 40 feet of shelly beds, separating into large masses, and well suited for the mason. From the third or lower subdivision it is that nearly the whole of our fossils are derived, the stone usually admitting their being cleaved with a knife.

The uppermost portion of this series, the planking*, which is from 8 to 10 feet thick, contains the most numerous suite of zoophagous Trachelipods, several of which are not found beneath it. To this succeeds a few feet of incoherent sandy rock, the upper part of which is nearly destitute of shells, or only occupied by a few species of small bivalves. The shells gradually increase in number downwards, and repose on several beds of hard shelly rock, locally called Weatherstone. Here more especially abound the valves of small oysters, which at length constitute no inconsiderable portion of the mass, and whose peculiar structure imparts such great hardness to the deposit, that the lower few inches strike fire with the tools of the workmen.

These shelly beds or weatherstones have a high character for durability; they have a coarse aspect; when once dried by exposure to the sun they do not readily absorb water, and consequently resist the action of frost; a careful selection is however necessary to ensure this desideratum. The south transept of Minchinhampton church, five centuries old, is built of this stone, and notwithstanding its very exposed situation, displays all the sharpness and distinctness in its angles and carving which we should expect in a modern edifice.

The Fuller's earth which underlies these deposits is but partially and imperfectly exposed within the district; it consists of a series of brown and blue marls and clays traversed by three or four bands of a hard argillaceous rock locally called clay rag. Some portions of the clays, and more especially the rag-stones, are made up of the valves of small oysters, chiefly *Ostrea acuminata*; the organic remains however are far from numerous when counted by number of species; they are nearly all bivalves, and I have not observed any which are not likewise found in the weatherstones above. The Fuller's earth constitutes the most fertile soil in this part of the county; when properly drained it

* A local term indicating a thin-bedded stone.

is well-adapted for pasturage and orchards, which together with a good supply of water derived from the superincumbent oolite, has made it in populous districts the chosen seat of man's habitation; accordingly its course may be traced by a belt or terrace, more or less wide, of houses and gardens encircling the hill-sides. Landslips from such a yielding deposit, as might be expected, are frequent, and thereby render the barren slope of the inferior oolite fertile: a coating of its marls sometimes extends even down to the lias. The numerical proportion of species obtained by me from the Minchinhampton Great Oolite are in number as follows:—

Bivalves 164, Univalves 141, Radiaria 13, Cephalopoda 9. Of the latter 6 are Ammonites; these are so scarce, that 50 specimens probably exceed the entire number. Of *Nautili* there are two species, one of which has furnished only three specimens, and the other is far from numerous. The Belemnites have only one species, small and likewise scarce.

Of the 141 Univalves 45 pertain to carnivorous genera, exclusive of 8 species of *Phasianella*, the living shells of which are now known to be both carnivorous and phytophagous. These genera are, *Nerinæa* 13 species, *Cerithium* 5, *Murex* 6, *Buccinum* 2; a new group of large shells belonging to the *Muricidæ*, to which as yet no generic appellation has been given, 4 species; *Pleurotoma* 1; *Hippocrenes*, a group of winged shells differing from the *Rostellariæ* of the recent period, 10 species; *Fusus*, or a group at least belonging to the *Fusinæ*, 4 species.

This extreme paucity of the Cephalopoda, taken in connexion with the occurrence of numerous genera and species of carnivorous univalves, is a remarkable circumstance. We know that previously throughout the lias and inferior oolite the Cephalopods reigned supreme amongst the molluscous tribes. Subsequently also the Oxford clay and Portland oolite contained them in nearly equal profusion. With these facts before us, the inquiry naturally follows,—Were there any peculiar circumstances connected with the mineral character of the deposit at the locality in question, and what was the probable depth of the sea over the shelly beds; since we find here zoophagous tribes differing from those of warm seas at the present time not very materially either in number or in their generic affinities? First, with regard to the nature of the deposit, or at least the more shelly portions of it:—In the planking and Weatherstone beds we find heaps of broken shells piled diagonally, the bivalves rarely having both valves in apposition; with these are fragments of wood, crabs' claws, joints of Apiocrinite and Pentacrinite, ossicula of Ophiura, palates and teeth of fishes, small bouldered fragments of Madrepores, and nodules of rock apparently

foreign to the deposit: these conditions vary and change every few yards, as likewise does the mineral character of the beds;—the results, in fact, of littoral action; of a shallow sea where the shells were subjected to strong currents producing hasty deposits and frequent trituration. The oolitic structure is rather scanty and very uncertain. As a complete contrast to these conditions, the Great Oolite in the vicinity of Bath may be cited. The rock is there thick-bedded; the oolitic structure prevails; the shells are few, and those chiefly *Terebratulæ*; the denizens, it may be presumed, of a deep and tranquil sea, in which corals and sponges multiplied and attained large dimensions. In Mr. Lonsdale's list of 31 species of Mollusca from the Bradford clay, Bath oolite and Fuller's earth of that neighbourhood, no less than 8 are *Terebratulæ*, and a *Crania* has since been added; a larger number of Brachiopods than will be found in the 327 Minchinhampton species which I have tabulated.

The list given by Mr. Buckman, in his 'Geology of Cheltenham,' from the Bradford clay and Stonesfield slate of the Cotteswolds in the north-eastern part of this county, comprises 5 Radiaria, 2 Terebratulæ, 44 Bivalves, 6 Cephalopoda, and 19 Univalves. Stonesfield has yielded a rich store of remains of reptiles, fishes, crustacea and land plants, but the conchological list is but meagre, and we are nearly destitute of information with regard to the shells of the Great Oolite in its long course through the counties of Northampton and Lincoln. Yorkshire, on the other hand, has found able illustrators in Phillips, Williamson and Bean, the latter gentleman having given, in the 'Magazine of Natural History for 1839,' a list of fossils from the stratum called Cornbrash in that county, consisting of 4 Radiaria, 3 Annulata, 91 Bivalves, 16 Univalves, and 3 Cephalopoda. Unfortunately, however, the rocks beneath the Oxford clay in that county form a great carboniferous series of deposits accumulated in an estuary, and will not allow of its subdivisions being identified with those of the middle and west of England. From this cause the shells have little more than a local value, since we cannot be sure that any particular stratum is contemporaneous with another in a different locality. On looking at these lists, together with those relating to the oolitic rocks of France, Germany and Switzerland, we are struck with the great paucity of univalves as compared with the small district of Minchinhampton.

A careful scrutiny however of various foreign works which bear upon the subject,—of the works of Goldfuss, Roemer, Dunker, Deslongchamps, d'Archiac, &c.—has convinced me, that if any peculiarity exists with regard to the Minchinhampton fossils it is at least of a very limited nature, inasmuch as nearly

one-half the entire number of bivalves can be identified in those works, a considerable number being from the coral rag of Hohenggelsen, which seems to be the equivalent of our Great Oolite. Among the univalves, the general resemblance to the Minchinhampton shells is so great, that at first we feel prepared to identify the greater number of them; a closer scrutiny undeceives us, and ultimately we are surprised at the very few which we can call our own. It may be suspected indeed, that the meagre lists of univalves hitherto published relating to the formation in question are the result, not so much of an actual deficiency of those shells, as of the difficulty of separating them from the stone in a condition sufficiently well-preserved to admit of specific characters being recognized. The oolite of our district itself furnishes an instance in illustration; almost the entire suite of univalves are procured from quarries to the north and west of the town, and even within those limits are certain localities from which the univalves can hardly be separated; but in the upper and middle subdivisions, to the east of the town, we can obtain but few, and those only which approach the globular figure, as *Natica* and *Bulla*, usually in the form of casts; with slender spiral shells the attempt is hopeless. These circumstances however are altogether independent of the great fact forced upon our attention,—viz. the scarcity and almost entire disappearance of the Cephalopoda from the sea of this portion of the Cotteswolds during a period in which deposits 200 feet in thickness were formed, and the simultaneous appearance of a large number of new and more simple forms to supply their place.

With our present very scanty knowledge of the circumstances which conduce to change of species on the floor of the sea, reasoning would be little better than conjecture; I have therefore rather preferred to state facts as they are presented to my notice, reflecting that every such contribution, however insignificant, is something added to the general store of knowledge, and consequently an aid to our conceptions of the operation of that infinite and all-pervading wisdom which is exemplified equally in the lowest as in the highest beings of creation.

Hence, though it is well known (as above-quoted from Dr. Buckland), that throughout the vast deposits of the secondary rocks those important tribes of Cephalopods, the Ammonites and Belemnites, reigned supreme amongst the molluscous races, and that they became extinct prior to the commencement of the tertiary æra, their paucity in the Great Oolite of Minchinhampton would lead us to infer that some peculiar conditions of sea-bottom existed at that locality which were unfavourable to their increase. But so far from the carnivorous Trachelipods "not having existed prior to the commencement of the tertiary æra,"

we here find them in the middle of the secondary deposits in great force and variety, forming in fact a considerable proportion of the whole number of univalves, and consequently existing long before the extinction of the Ammonites and Belemnites.

It is highly probable that Dr. Buckland would not now adhere to the above theory, stated some ten or eleven years ago; but having the authority of his name and occurring in a standard work, it still passes current with the reading public, and has frequently been quoted by subsequent writers.

On a future occasion I anticipate the pleasure of presenting to the Club some remarks more in detail on the new or less-known molluscous forms which occur in this formation. The Inferior Oolite within the narrow limits of my observation has likewise yielded a considerable store of novel materials for investigation: these would require a separate communication.

XIV.—*Descriptions of new or imperfectly described Lepidopterous Insects.* By Edward Doubleday, Esq., F.L.S., Assistant in the Zoological Department of the British Museum, &c.

[Continued from vol. xix. p. 389.]

Fam. PIERIDÆ.

Genus Euterpe.

Eut. Manco. Eut. alis omnibus supra nigro-fuscis, atomis cinereis adspersis, anticis fasciis duabus transversis macularibus, maculisque marginalibus cinereis; posticis macularum sagittiformium serie, maculisque marginalibus cinereis. Exp. alar. 2 unc. vel 50 mill.
Hab. Bolivia.

Above: anterior wings fuscous, sprinkled with cinereous, the cell with a cinereous spot at the extremity; followed by two transverse macular bands of the same colour running nearly parallel to the outer margin, the inner one becoming wider and less defined towards the inner margin, the outer margin marked with a series of cinereous spots between the nervules. Posterior wings fuscous at the base, then thickly sprinkled with cinereous scales, so as to form a broad band across the middle of the wing in continuation of the first band of the anterior wings: beyond the cell fuscous, with a series of sagittate spots composed of cinereous and fuscous scales, about equally mixed, and on the margin itself a series of cinereous spots. Below: the anterior wings are grayish white, towards the apex slightly silvery; below the subcostal and also the median nervure is a fuscous vitta, arising from the base, and at the end of the cell a fuscous spot; about half-way between the cell and the outer margin is a transverse fuscous band, nearly straight internally, very angular ex-